K8019

ILLUSTRATED ASSEMBLY MANUAL H8019IP*1

PROXIMITY CARD READER WITH USB INTERFACE

velleman projects

@velleman RnD

Features

- Store up to 250 tags.
- With USB interface for config-management.
- Free tag management application for PC.
- Fully documented protocol, write your own application.
- Tags can also be entered using a 'mastercard'.
- Toggle or pulse NO/NC relay output.
- Adjustable pulse time: 1s to 4 min. approx.
- 3 status leds and buzzer.
- Two tags supplied (card-type).
- Works standalone.

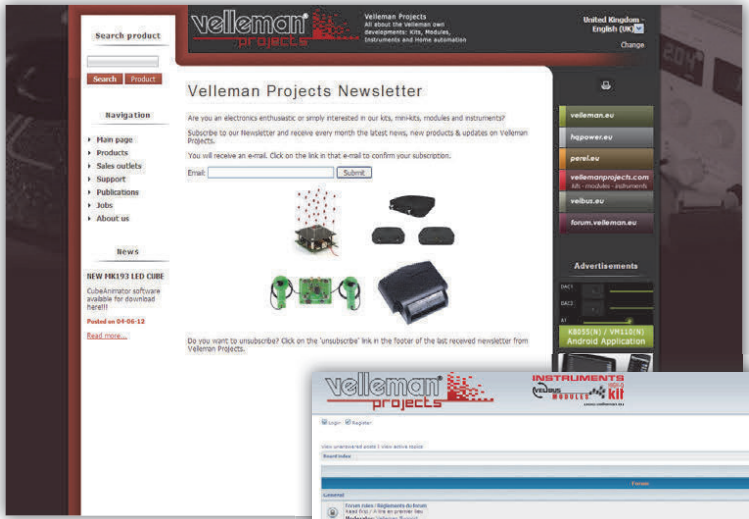
Specifications

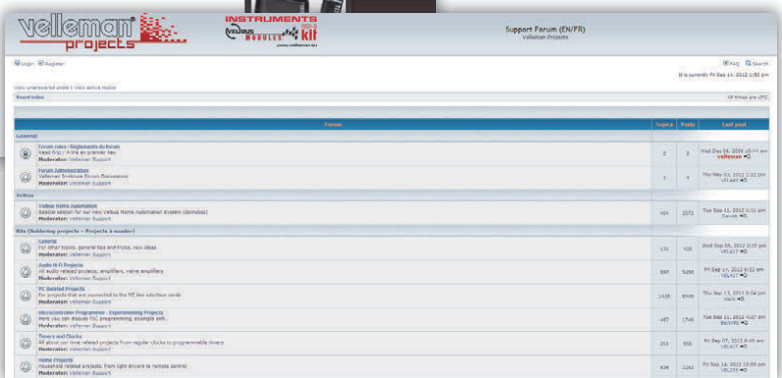
- EM4100 compatible.
- Relay contact: 3A/24VDC.
- Power supply: 12VDC or 5VDC (USB)*
- Power consumption: 100mA max.
- Dimensions: 69x80x47mm / 2.71x3.15x1.85"

Optional:

◊ Acces card : HAA2866/TAG
◊ Access badge : HAA2866/TAG2

***Only for confguration and tag learning. Relay will not operate.**





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9890 Gavere
(België)

assembly hints

1. Assembly (Skipping this can lead to troubles !)

Ok, so we have your attention. These hints will help you to make this project successful. Read them carefully.

1.1 Make sure you have the right tools:

- A good quality soldering iron (25-40W) with a small tip.
- Wipe it often on a wet sponge or cloth, to keep it clean; then apply solder to the tip, to give it a wet look. This is called 'thinning' and will protect the tip, and enables you to make good connections. When solder rolls off the tip, it needs cleaning.
- Thin raisin-core solder. Do not use any flux or grease.
- A diagonal cutter to trim excess wires. To avoid injury when cutting excess leads, hold the lead so they cannot fly towards the eyes.
- Needle nose pliers, for bending leads, or to hold components in place.
- Small blade and Phillips screwdrivers. A basic range is fine.

For some projects, a basic multi-meter is required, or might be handy.

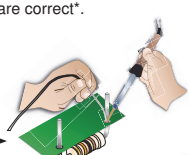
1.2 Assembly Hints :

- Make sure the skill level matches your experience, to avoid disappointments.
- Follow the instructions carefully. Read and understand the entire step before you perform each operation.
- Perform the assembly in the correct order as stated in this manual.
- Position all parts on the PCB (Printed Circuit Board) as shown on the drawings.
- Values on the circuit diagram are subject to changes, the values in this assembly guide are correct*.
- Use the check-boxes to mark your progress.
- Please read the included information on safety and customer service.

* Typographical inaccuracies excluded. Always look for possible last minute manual updates, indicated as 'NOTE' on a separate leaflet.

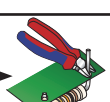
1.3 Soldering Hints :

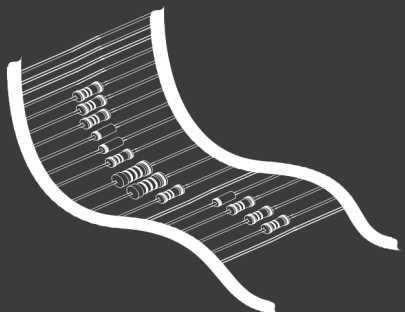
1. Mount the component against the PCB surface and carefully solder the leads.



2. Make sure the solder joints are cone-shaped and shiny.

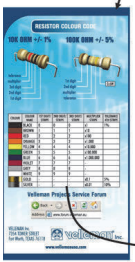
3. Trim excess leads as close as possible to the solder joint.

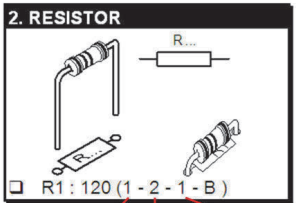




REMOVE THEM FROM THE TAPE ONE AT A TIME !

Included in this kit



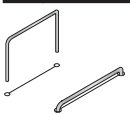


COLOUR	COLOUR NAME	1ST DIGIT/ STRIPE	2ND DIGIT/ STRIPE	3RD DIGIT/ STRIPE	MULTIPLIER STRIPE	TOLE 4TH
	BLACK	0	0	0	x1	1%
	BROWN	1	1	1	x10	
	RED	2	2	2	x100	
	ORANGE	3	3	3	x1.000	
	YELLOW	4	4	4	x10.000	
	GREEN	5	5	5	x100.000	
	BLUE	6	6	6	x1.000.000	

DO NOT BLINDLY FOLLOW THE ORDER OF THE COMPONENTS ONTO THE TAPE. ALWAYS CHECK THEIR VALUE ON THE PARTS LIST!

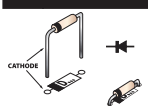
I CONSTRUCTION

1 Jumper wire



❑ J1

2 Diodes



Watch the polarity!

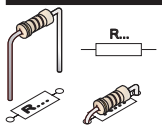
❑ D1: 1N4148
❑ D2: 1N4148
❑ D3: 1N4148
❑ D4: 1N4148
❑ D5: 1N4148

3 Zenerdiodes

Watch the polarity!

❑ D6: 1N4007
❑ D7: 1N4007

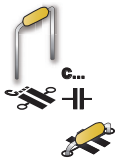
4 Resistors



❑ R1: 470 (4 - 7 - 1 - B)
❑ R2: 470 (4 - 7 - 1 - B)
❑ R3: 470 (4 - 7 - 1 - B)
❑ R4: 100K (1 - 0 - 4 - B)
❑ R5: 100K (1 - 0 - 4 - B)
❑ R6: 10K (1 - 0 - 3 - B)
❑ R7: 10K (1 - 0 - 3 - B)
❑ R8: 10K (1 - 0 - 3 - B)
❑ R9: 220K (2 - 2 - 4 - B)
❑ R10: 220K (2 - 2 - 4 - B)
❑ R11: 4K7 (4 - 7 - 2 - B)
❑ R12: 4K7 (4 - 7 - 2 - B)
❑ R13: 1K (1 - 0 - 2 - B)
❑ R14: 39K (3 - 9 - 3 - B)
❑ R15: 1M (1 - 0 - 5 - B)
❑ R16: 10 (1 - 0 - 0 - B - 9)*
❑ R17: 330 (3 - 3 - 1 - B)
❑ R18: 330 (3 - 3 - 1 - B)
❑ R19: 1K (1 - 0 - 2 - B)
❑ R20: 560 (5 - 6 - 1 - B)
❑ R21: 1K2 (1 - 2 - 2 - B)
❑ R22: 10K (1 - 0 - 3 - B)
❑ R23: 10 (1 - 0 - 0 - B - 9)*

* Metalfilm resistor

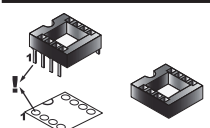
5 Ceramic Capacitors



❑ C7 : 100nF (104)
❑ C8 : 100nF (104)
❑ C9 : 100nF (104)
❑ C10 : 100nF (104)
❑ C11 : 100nF (104)

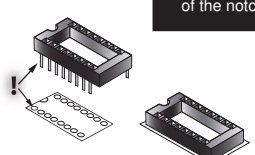
❑ C20 : 100nF (104)

6 IC sockets



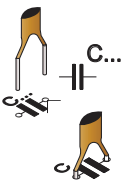
❑ IC1: 8p

Watch the position of the notch!



❑ IC1: 16p

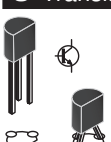
7 Ceramic Capacitors



- ❑ C1: 10nF (103)
- ❑ C2: 10nF (103)
- ❑ C3: 10nF (103)
- ❑ C4: 4.7nF (472)
- ❑ C5: 4.7nF (472)
- ❑ C6: 4.7nF (472)
- ❑ C12: 100pF (101)
- ❑ C13: 100pF (101)
- ❑ C14: 470pF (471)
- ❑ C16: 22pF (22)
- ❑ C17: 22pF (22)

❑ C18:470nF (474)

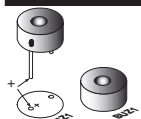
8 Transistors



- ❑ T1: BC547B
- ❑ T2: BC547B
- ❑ T3: BC547B

❑ **T4: BC557**

9 Buzzer



Watch the polarity!

❑ BUZ1

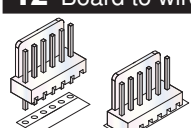
10 Terminal block

❑ SK5: 2p (power)

11 USB connector

❑ SK3

12 Board to wire 'male'



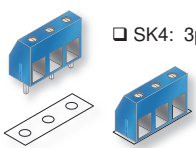
❑ SK1: 6p

13 Electrolytic capacitors

Watch the polarity!

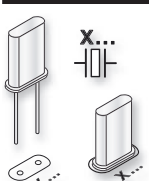
❑ C15: 4,7µF
❑ C19: 100µF

14 Terminal block



❑ SK4: 3p (Relay out)

15 Quartz crystal



❑ X1: 12MHz

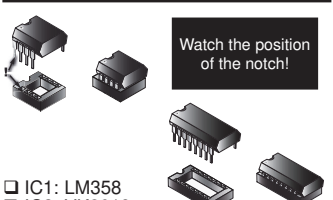
16 Voltage regulator

❑ VR1: UA7805

17 Relay

❑ RY1: VR15121C

18 IC's

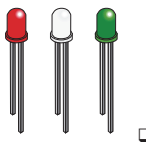


Watch the position of the notch!

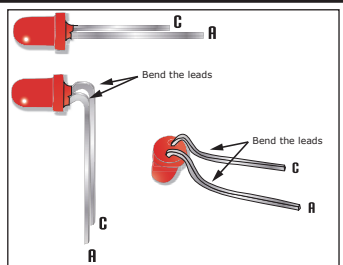
❑ IC1: LM358
❑ IC2: VK8019
(programmed PIC18F14K50-I/P)

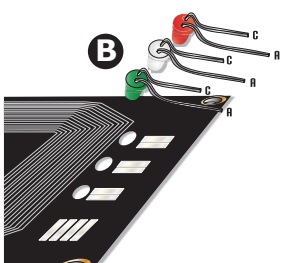
RFID reader PCB

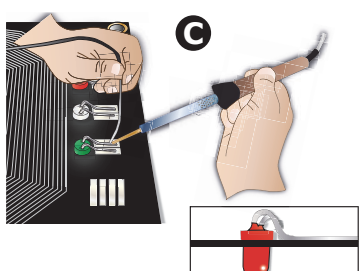
1 Led's. Watch the polarity!



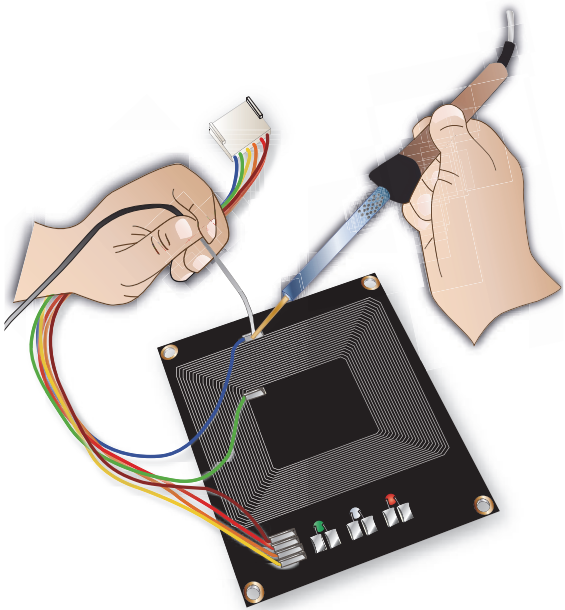
❑ LD1 (red)
❑ LD2 (blue)
❑ LD3 (green)

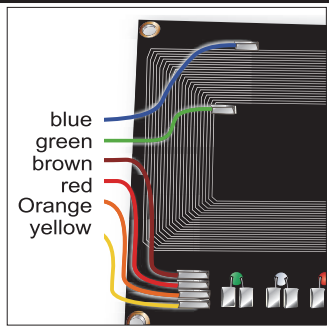


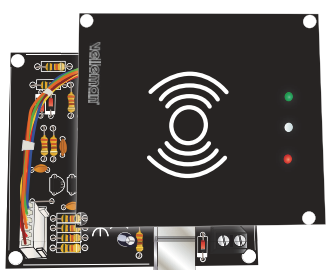




2 Board to wire (Female)

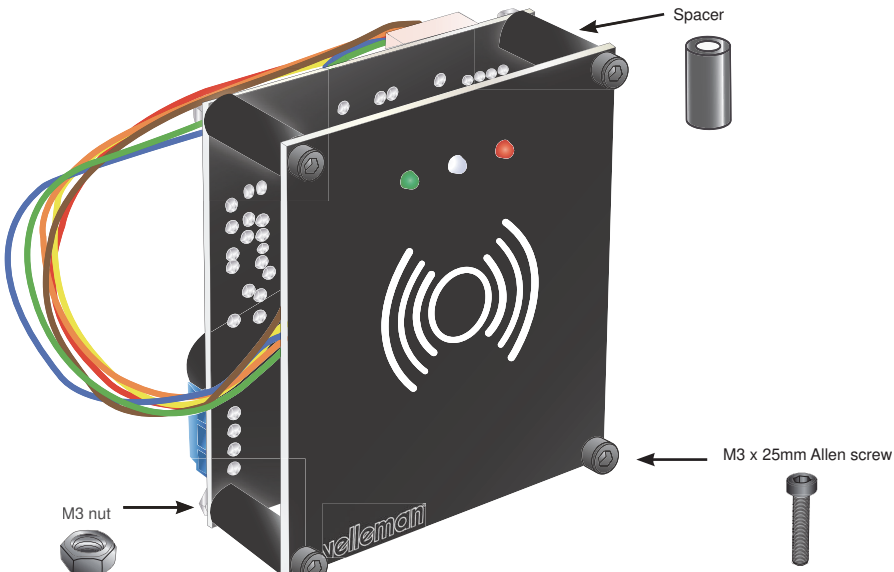




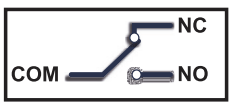


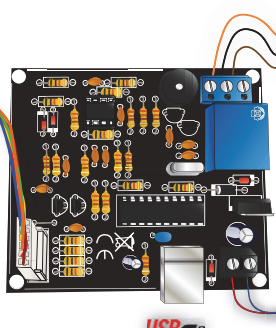
Connect to main board

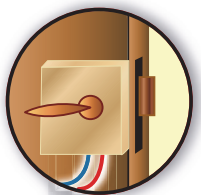
II ASSEMBLY



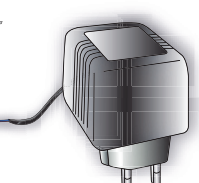
III HOOK-UP EXAMPLE







OUTPUT
Ex. Door-lock; security system, ...



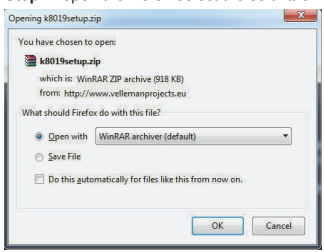
POWER SUPPLY: 12VDC

IV. SOFTWARE INSTALLATION

Remark: Software installation is not mandatory, since the first card that is learned puts the unit into learnmode. Once in learnmode, you can learn more cards. See page 15

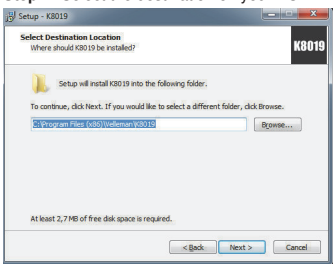
Step 1: Download the software on our website.

Step 2: open the file en select the software.

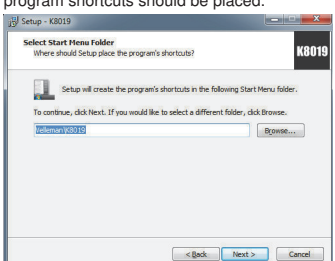


Step 3: Select “next” to begin the installation.

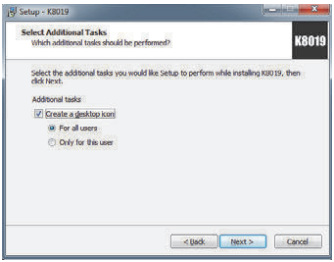
Step 4: Select the destination on your PC.



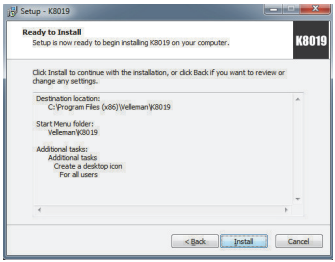
Step 5: Select the “Start folder” menu where program shortcuts should be placed.



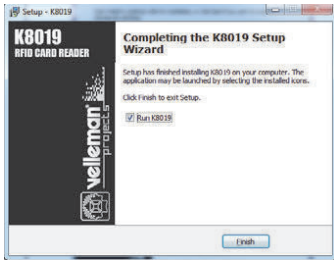
Step 6: Select additional tasks you would like to be performed.



Step 7: Select "install" for installing the software.



Step 8 : Click "finish" to exit setup.



V. DRIVER INSTALLATION

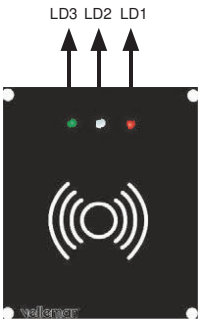
Connect the USB connector of the K8019 to your PC using an USB cable.

With the first connection, you should install the USB driver onto the PC first.

You can download the manual for installing the driver on our website.

VI. INDICATIONS

A. Leds



The card reader has three colored leds: green, blue and red.

LED	STATUS	
LD1	*ON*	*Relay off*
LD2	*ON*	*power on*
	Blinking	*learning mode enabled*
LD3	*ON*	*Relay energized*

B. Sound


• • • enter / leave learn mode


- - - invalid card


• Valid card / card stored (learning mode)

VII. SET-UP

Relay
When a valid card is presented the relay is energized.

The relay has three configurations (the configuration is done via the PC):

- **Toggle**: swipe= ON, swipe= OFF.
- **Momentary**: ON while card is present.
- **Timer**/**delayed**: swipe= ON for n seconds.

Learning mode

One card can be the master card, which is used to toggle learning mode.
If an invalid card is swiped while in learning mode, the card is added to the card reader's memory.

If the card reader contains 0 cards, then the next card swiped will automatically trigger learning mode and the card will be stored as the master card. Learning mode will automatically timeout after 30 seconds. If a card is swiped within this period, the timeout is reset to another 30 seconds.

- ***During learning mode, the relay remains OFF.***
- ***If you do not get a beep when presenting a card in learning mode, then the database is full (250 card limit).***
- ***A card can not be removed, this is only possible via the PC application.***

Validating a card

An RFID tag consists of five bytes. Only the last four bytes are used for validation. These last four bytes represent the number printed on the front of the RFID card. The first byte is considered to be the manufacturer's id and thus is ignored.

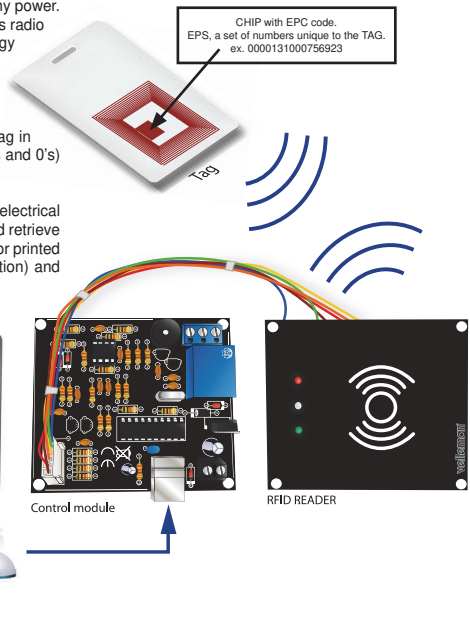
VIII. HOW DOES AN RFID WORK?

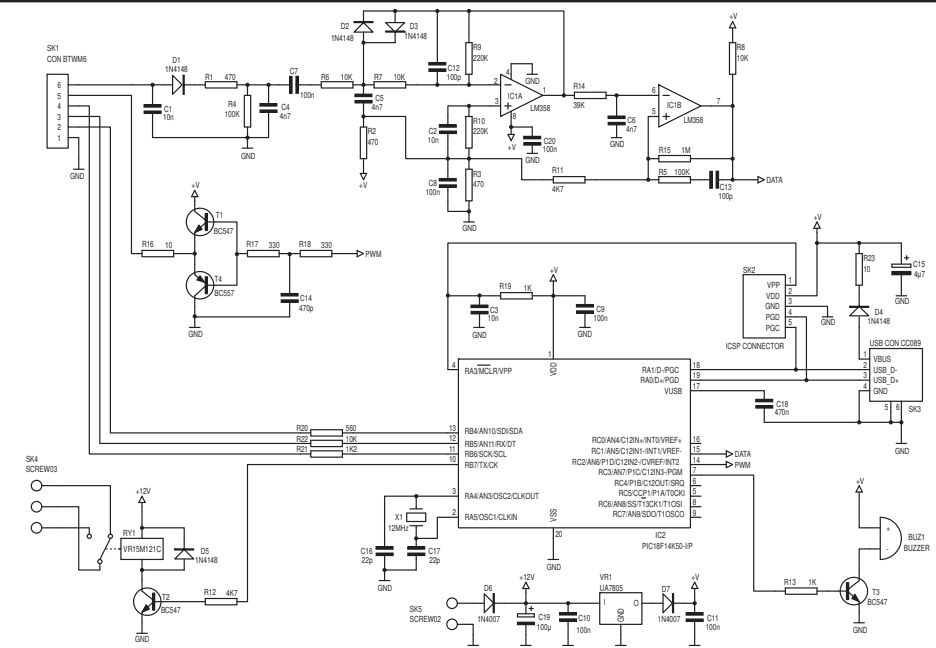
An RFID tag sleeps in normal mode: it does not perform any activities and does not use any power. This will change as soon as the tag moves through the reader's field. An RFID reader emits radio waves at a frequency similar to those of the tag. The tag antenna retrieves enough energy from these waves so as to exit the tag from the sleep mode and to power the microchip.

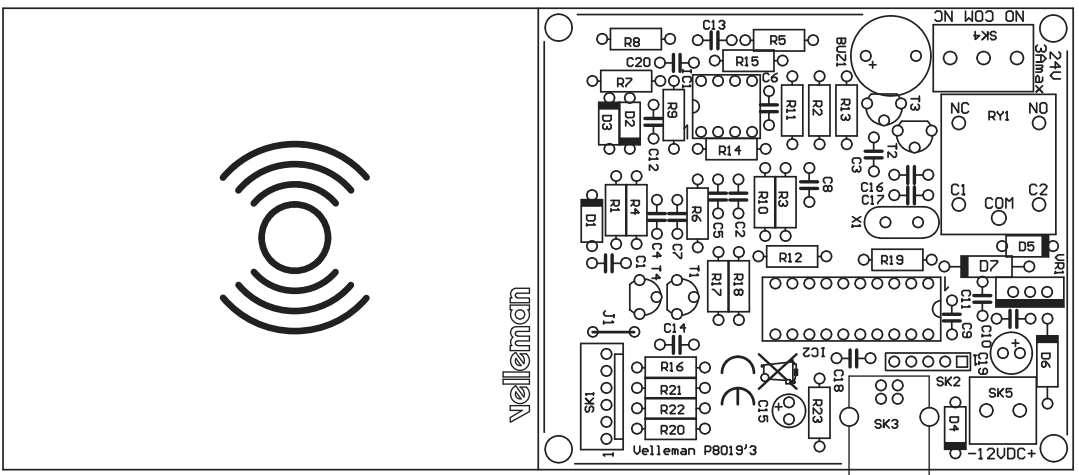
The tag's microchip initiates a wireless communication with the reader (comparable to what happens with a classic network) and receives a command. The chip will execute the command, resulting in a data transfer through the tag's antenna. In case of the passive tag in the example, the data consists of the unique serial number of the tag in binary format (1's and 0's) emitted as radio waves.

The antenna will pick up the data emission and sends it through a cable and in the form of electrical signals to the reader's control module. The module will in turn decode the radio signals and retrieve the binary data. The reader now has the tag's ID in digital format, which can be processed or printed immediately. This data will mostly be completed with additional data (e.g. time and location) and quickly forwarded to a processing unit or information system.

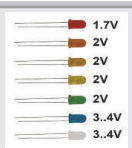
Important: The tag's chip has a unique number, i.e. the chip's serial number allocated during its manufacturing.



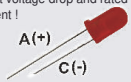

SK1
CON BTWM6
D1
1N4148
D2
1N4148
D3
1N4148
R1 470
R2 470
R3 470
R4 100K
R5 100K
R6 10K
R7 10K
R8 10K
R9 220K
R10 220K
R11 4K7
R12 4K7
R13 1K
R14 39K
R15 1M
R16 10
R17 330
R18 330
R19 1K
R20 560
R21 1K2
R22 10K
R23 10
C1 10n
C2 10n
C3 10n
C4 4n7
C5 4n7
C6 4n7
C7 100n
C8 100n
C9 100n
C10 100n
C11 100n
C12 100p
C13 100p
C14 470p
C15 4µ7
C16 22p
C17 22p
C18 470n
C19 100µ
C20 100n
IC1A
IC1B
LM358
IC2
PIC18F14K50-I/P
X1
12MHz
T1 BC547
T2 BC547
T3 BC547
T4 BC557
RY1
VR15M121C
D4 1N4148
D5 1N4148
D6 1N4007
D7 1N4007
VR1
UA7805
SK2
ICSP CONNECTOR
VPP
VDD
GND
PGD
PGC
SK3
USB CON CC089
VBUS
USB_D-
USB_D+
GND
SK4
SCREW03
SK5
SCREW02
BUZ1
BUZZER
DATA
PWM
+V
+12V
GND
RA3/MCLR/VPP
RA4/AN3/OSC2/CLKOUT
RA5/OSC1/CLKIN
RA1/D-/PGC
RA0/D+/PGD
VUSB
RB4/AN10/SDI/SDA
RB5/AN11/RX/DT
RB6/SCK/SCL
RB7/TX/CK
RC0/AN4/C12IN+/INT0/VREF+
RC1/AN5/C12IN1-/INT1/VREF-
RC2/AN6/P1D/C12IN2-/CVREF/INT2
RC3/AN7/P1C/C12IN3-/PGM
RC4/P1B/C12OUT/SRQ
RC5/CCP1/P1A/T0CKI
RC6/AN8/SS/T3CKI/T1OSI
RC7/AN9/SDO/T1OSCO

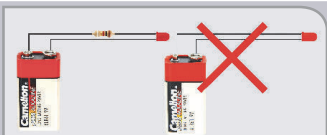

velleman
NO COM NC
SK4
24V
3Amax
BUZ
RY1
NC
NO
COM
C1
C2
D5
VR1
D7
R19
R12
IC2
SK2
SK3
SK5
D6
D4
-12VDC+
SK1
J1
R16
R21
R22
R20
C15
C18
R23
Velleman P8019'3

Leds and how to use them

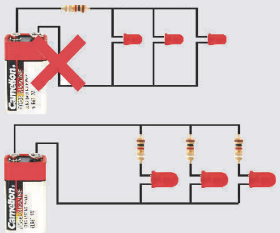


Leds feature a specific voltage drop, depending on type and colour. Check the datasheet for exact voltage drop and rated current !





Never connect leds in parallel



How to Calculate the series resistor:

Example: operate a red led (1.7V) on a 9Vdc source.
Required led current for full brightness: 5mA (this can be found in the datasheet of the led)

Supply voltage (V) - led voltage (V) / required current (A) = series resistance (ohms)

→ 9V - 1.7V / 0.005A = 1460 ohm

closest value : use a 1k5 resistor

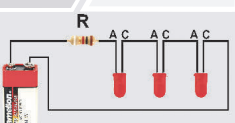
Required resistor power handling= voltage over resistor x current passed trough resistor

→ (9V - 1.7V) x 0.005A = 0.036W

a standard 1/4W resistor will do the job

LEDs in series:

Example: 3 x red led (1.7V) on 9V battery
Required led current for full brightness: 5mA
(this can be found in the datasheet of the led)



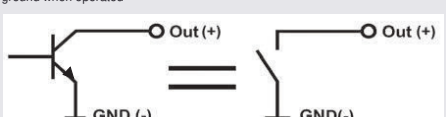
Supply voltage (V) - (number of leds x led voltage (V)) / required current (A) = series resistance (ohms)

→ 9V - (3 x1.7V) / 0.005A = 780 ohm

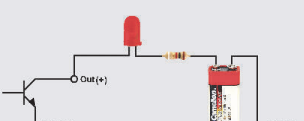
use an 820 ohm resistor

open collector outputs

An open collector output can be compared to a switch which switches to ground when operated



Example: How to switch an LED by means of an open collector output



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